

## CLAIMS

What is claimed is:

- 1        1. A process of forming a metallization comprising:
  - 2               forming a first interlayer dielectric (ILD) layer above a substrate;
  - 3               forming a first recess in the first ILD layer;
  - 4               filling the first recess with a first interconnect;
  - 5               forming a conductive first diffusion barrier layer above an on the first interconnect;
  - 6               forming an upper ILD layer above the first conductive diffusion barrier layer;
  - 7               forming an upper recess in the upper ILD layer to optionally expose the first
  - 8               conductive diffusion barrier layer;
  - 9               forming an upper interconnect in the upper recess; and
  - 10               forming a conductive upper diffusion barrier layer above and on the upper
  - 11               interconnect.

- 1        2. The process according to claim 1, wherein at least one of forming a conductive first
- 2        diffusion barrier layer and forming a conductive upper diffusion barrier layer includes:
- 3               electroless plating the conductive diffusion barrier layer.

- 1        3. The process according to claim 1, wherein at least one of forming a conductive first
- 2        diffusion barrier layer and forming a conductive upper diffusion barrier layer includes:

vapor depositing the conductive diffusion barrier layer, selected from chemical vapor deposition, plasma-enhanced chemical vapor deposition, atomic layer chemical vapor deposition, and physical vapor deposition.

4. The process according to claim 1, further including:

forming a barrier film in at least one of the first recess and the upper recess; and  
optionally forming a conductive seed film over the barrier film.

5. The process according to claim 1, further including:

forming a barrier film in at least one of the first recess and the upper recess;

forming a conductive diffusion barrier film over at least one of the barrier film;

and

optionally forming a conductive seed film over the conductive diffusion barrier

6. The process according to claim 1, wherein forming a first ILD layer includes

forming an organic ILD layer, further including:

forming a hard mask above and on the organic ILD layer; and patterning an opening in the hard mask.

7. The process according to claim 1, further including:

forming a first hard mask above and on the first ILD layer; patterning an opening in the first hard mask;

4 forming an upper hard mask above and on the upper ILD layer;  
5 patterning an opening in the upper hard mask.

1 8. The process according to claim 1, wherein forming a first ILD layer includes:  
2 forming an inorganic first bottom ILD layer; and  
3 forming an organic first top ILD layer.

1 9. The process according to claim 8, wherein forming a first recess includes:  
2 forming a dual-damascene recess in the inorganic first bottom ILD layer and in  
3 the organic first top ILD layer.

1 10. The process according to claim 9, further including:  
2 forming a first hard mask above and on the organic first top ILD layer; and  
3 patterning an opening in the first hard mask.

1 11. The process according to claim 8, wherein forming an upper ILD layer includes:  
2 forming an inorganic upper bottom ILD layer; and  
3 forming an organic upper top ILD layer, and wherein forming an upper recess  
4 includes forming a dual-damascene recess in the inorganic upper bottom ILD layer and in  
5 the organic upper top ILD layer.

1 12. The process according to claim 11, further including:  
2 forming an upper hard mask above and on the upper bottom ILD layer; and

3 patterning an opening in the upper hard mask.

1 13. The process according to claim 1, wherein forming a first ILD layer includes:  
2 forming an organic first bottom ILD layer; and  
3 forming an inorganic first top ILD layer.

1 14. The process according to claim 13, wherein forming a first recess includes:  
2 forming a dual-damascene recess in the organic first bottom ILD layer and in the  
3 inorganic first top ILD layer.

1 15. The process according to claim 14, further including:  
2 forming a first hard mask above and on the organic first bottom ILD layer; and  
3 patterning an opening in the first hard mask.

1 16. The process according to claim 13, wherein forming an upper ILD layer includes:  
2 forming an organic upper bottom ILD layer; and  
3 forming an inorganic upper top ILD layer, and wherein forming an upper recess  
4 includes forming a dual -damascene recess in the organic upper bottom ILD layer and in  
5 the inorganic upper top ILD layer.

1 17. The process according to claim 16, further including:  
2 forming an upper hard mask above and on the upper bottom ILD layer; and  
3 patterning an opening in the upper hard mask.